MONTHLY WEATHER REVIEW,

FEBRUARY, 1875.

WAR DEPARTMENT,

Office of the Chief Signal Officer,

DIVISION OF

TELEGRAMS AND REPORTS FOR THE BENEFIT OF COMMERCE AND AGRICULTURE.

INTRODUCTORY.

The current Review is based upon the tri-daily telegraphic weather reports from seventy-eight stations in the United States and Canada and upon manuscript material from the following stations:

Canadian Meteorological Service, 11; U. S. Army Signal Service, 86; U. S. Army Surgeons, 25; U. S. Naval Hospitals, 1; Regular Volunteer Observers, 275; Logs of Vessels, and Miscellaneous sources.

The noticeable features of the month have been: First, the temperature, which, in all sections, has been below the mean of previous years, and in the northern half of the country lower than during any February recorded for the past twenty and in some sections past forty years. Second. An excess of rain in portions of the Gulf States and Tennessee. Third. The severe storm of the 23d, accompanied by thunder and lightning over a large portion of the country, and in Missouri and Iowa by a destructive tornado; floods also followed in Tennessee. Fourth. The ice-blockade of the Middle and East Atlantic coast, which has not been exceeded in severity before during the present century, being comparable to that of 1780.

BAROMETRIC PRESSURE.

The general distribution of barometric pressure during the month is shown by the isobars on Chart No. II, from which it will be seen that, on the average, the barometer has been lower in the Northern and Eastern sections of the country than it was in February, 1874, but has been higher in the Southern States.

(1.) *Areas of high barometer.*—The surface flow of cold air from British America has, as usual, taken place in connection with a series of areas of high barometer, which can be generally traced from Manitoba and Dakota southward. The cold surface-currents have, as a rule, extended southward to Texas, producing "Northers" on the Gulf coast, while the supply of cold has, at the same time, sufficed to cover the country eastward. The inward movement of the upper clouds and the outward flow of the lower stratum of air have, as usual, been well marked. The radiation outward during the nights and the early mornings of the 4th, 6th, 9—10th, 12—13th, 14—15th, lowered the temperature of the air at the earth's surface sufficiently to bring about in the central regions of the areas of high barometer Nos 1, 3, 4, 6 and 7 respectively, such depressions of temperature as are rarely witnessed, securing for the month the reputation of having been in general one of the coldest on record. It has been very generally evident that the cold air flowing southeastward over Dakota and Minnesota was confined

to the lowest portions of the country, so that, for instance, the average temperature of month is decidedly lower in the river valleys than on the adjacent high grounds. On several occasions areas of high barometer have been separated by belts of strongly contrasted winds and temperatures, which have been marked by slight depressions trending north or northeastward, forming troughs rather than oval areas of low barometer. Under favorable conditions, these troughs have developed into centres of low barometer, as fully detailed in section (2.)

No. 1 may be considered as being central on February 1st in northern Alabama; moved thence eastward over North Carolina, remaining on the Atlantic coast during the 2d.

No. 2 passed over Manitoba on the 1st, Montana on the 2d, reaching Texas on the 3d; extended eastward to Illinois on the 4th; was central in Tennessee on the 5th and in Alabama on the 6th, by which time area No. 3 had, by extending rapidly southward, overtaken No. 2, and by its relatively greater pressure, gave rise to low barometer No. V, as detailed below.

No. 3 passed over Manitoba and Dakota on the 5th. The pressure, as reduced to sea-level, during the 6th, was one of the highest that has been recorded, as shown from the following table:

	Feb'y 6, 7:35 A. M.	Feb'y 6, 4:35 P. M.	Feb'y 6, 11 P. M.		Feb'y 6, 7:35 A. M.	Feb'y 6, 4:35 P. M.	Feb'y 6, 11 P. M.
Pembina.....	30.91	30.70	30.57	St. Paul.....	30.87	30.82	30.72
Bismarck.....	30.92	30.79	30.62	Yankton.....	30.96	30.98	30.95
Breckenridge.	30.96	30.90	30.78	Omaha.....	30.76	30.84	30.83
Duluth.....	30.88	30.75	30.60				

After passing over Minnesota on the 6th, it extended thence rapidly southward to Texas and Louisiana by midnight of the 7th.

No. 4 was central in Manitoba on the 8th, and extended on the 9th over Wisconsin, Michigan and Pennsylvania, with very low temperatures, as detailed in subsequent sections. On the 10th the area was central in Maryland, passing thence eastward to the ocean, with possibly a tendency northeastward along the coast.

No. 5 passed on the 10th from Manitoba to Kansas, and on the 11th to Texas, extending thence eastward to Alabama. On the 12th its movement continued eastward to the South Atlantic coast.

No. 6 passed from Manitoba on the 12th, over Dakota and Minnesota on the 13th, to Iowa on the 14th; thence over Illinois and Missouri into Tennessee on the 16th; thence eastward over Cape Hatteras by the morning of the 17th.

No. 7 passed on the 16th over Manitoba and Dakota; over Iowa and Illinois on the 17th, and over West Virginia to the Middle Atlantic coast on the 18th.

No. 8. The low barometer prevailing on the 19th over the greater portion of the country seems to have allowed a flow of air eastward into Texas and Indian Territory, forming high barometer No. 8, which was central in the Southwest on the morning of the 20th, and passed thence eastward over Louisiana, reaching Georgia on the afternoon of the 21st; it extended thence northeastward to Cape Hatteras during the next two days.

No. 9. Simultaneously with the preceding an area of high barometer also passed from Western Dakota at midnight of the 20th eastward over the Lakes to Lake Erie on the afternoon of the 21st.

No. 10. The preceding area was closely followed by No. 10, which left Manitoba on the 21st, was central in southern Minnesota at 11 P. M. of the 22nd, and extended thence eastward during the 23d to the mouth of the St. Lawrence.

No. 11 passed over Manitoba on the 23d; was central in northwestern Minnesota on the morning of the 24th, and moving rapidly southward reached Kansas on the morning of the 25th, and the Texas and Louisiana coasts later in the day, then moved eastward over Mississippi and Alabama to the South Atlantic coast on the afternoon of the 26th.

No. 12 was central over Manitoba on the 25th, and over Kansas by the 27th, 7.35 A. M. The southern portion was then dissipated while the northern portion passed eastward, being over Minnesota and Iowa on the 27th, 4.35 P. M.; over Wisconsin and Illinois on the 27th, 11 P. M., and thence over Michigan, Lakes Huron and Ontario to New York on the 28th, 11 P. M.

(2.) *Areas of low barometer.*—Thirteen areas of low barometer are recorded for February; their distinguishing feature has been the tendency to the formation of troughs of depression between two extended areas of high pressure and of contrasted temperatures. Of these areas of low pressure three have developed into notable storms, *i. e.*, No. II, in Illinois, Iowa and Missouri, on the 2d; in Kentucky, Illinois, New York and North Carolina, on the 3d, and the Lower Lakes on the 4th; No. XI, in Missouri, Iowa, Illinois, Wisconsin and Michigan, on the 23d, and No. XII, in Georgia, South Carolina, North Carolina, Virginia, Maryland, Delaware, New Jersey and Massachusetts, on the 25th.

No. I. The map of the morning of February 1st shows the storm No. XII of January, off the coast of Nova Scotia, whence it moved northeastward, as shown on the accompanying chart, on which the track of the first area of low barometer proper to February is shown to have that day passed over Lake Superior, while areas of high barometer Nos. 1 and 2 were respectively central in Georgia and Dakota. No. I moved slowly eastward, and was attended only with southerly winds and threatening weather in Canada.

Nos. II and III. The depression No. II originated on the first in Kansas, in a region of conflicting cold northerly and warm southerly winds, the boundaries between which were especially well marked at midnight, when the temperature at Leavenworth was forty-five degrees and at Omaha fourteen degrees. The storm-centre passed northeastward over the northern portion of Michigan and thence eastward to the St. Lawrence valley. The dimensions of this disturbance are best shown in the following table:

	CENTRAL LOWEST BAROMETER.	AREA ENCLOSED BY THE ISOBAR OF 29.60.
		Square Miles.
February 2—7.35 A. M.	29.60	5.000
" " 4.35 P. M.	29.45	60.000
" " 11 P. M.	29.40	80.000
February 3—7.35 A. M.	29.10	240.000
" " 4.35 P. M.	(?)	350.000?
" " 11 P. M.		600.000?

In consequence of the rapid fall over New England during the 3d, a secondary centre, marked as No. III on the chart was formed, but its progress subsequent to the 3d instant could not be further traced with sufficient distinctness to decide whether these two centres remained separate or coalesced over Newfoundland. The latter seems more probable, and is indicated by the dotted lines.

Nos. IV and V. The area of high barometer No. 2 was followed by a slight depression, entered as No. IV on the accompanying chart, which was located on the morning of the 5th in Minnesota. It soon passed north and east, and may be considered as a minor feature in the advance southward of the unusually extensive flow of cold air forming high barometer No. 3. In a similar way, a depression, No. V, which moved during the 7th eastward from Minnesota over the Lakes into the St. Lawrence valley, appears to have died away on the 8th, or to have been merged into the more important depression, also designated as No. V, which was developing in the Southwest on the 6th, and after moving eastward over South Carolina on the 7th, then developed into a well-defined storm-centre, moving northeastward to the coast of Nova Scotia and accompanied by gales along the middle and east Atlantic coasts.

Nos. VI and VII. The supply of cold, dry air, afforded by high barometer No. 3, sufficed to maintain clear weather west of the Mississippi until the afternoon of the 8th, at which time warm, southerly winds and cloudy weather prevailed over Texas, but cold, northerly winds in the lower Missouri valley. In this region, and on this afternoon, is placed the beginning of low barometer No. VI, which cannot be distinctly marked until the morning of the 10th. During this interval of forty-eight hours the increasing cloudiness of the 8th had been followed by rain on the 9th, and easterly winds steadily blew over the entire country west of the Mississippi, while the great areas of high barometers Nos. 3 and 4 moved from Minnesota to the middle Atlantic coast. By midnight of the 9th the area of snow extended from Kansas into Manitoba, and that of rain from Kansas to the Gulf, affording a fine instance of the result of the ascent of air up the inclined plains of the Rocky Mountain system. By the morning of the 10th, the inflow of cold northwest winds had begun in Manitoba and Dakota, and the belt or trough over which the pressure was less than 29 80 inches, was 700 miles long, in a north and south direction, by 100 broad. We have indicated by a zig-zag line on Chart No. I, the fact that by the afternoon of the 10th, the northern end of this belt of low pressure moved rapidly eastward into Wisconsin, while the southern end remained stationary in Texas. It is probable that on this afternoon there existed a number of small areas of 29.70 inches, or less, constituting a belt of low barometer at least 1,000 miles long. The heavier precipitation took place in the central portion of this line and throughout the Southern States, but the barometric depression in these regions rapidly closed up, and the low barometer was at midnight of the 10th central in Upper Michigan, at which time heavy snows, with southerly winds, prevailed over the Lake region, Middle and Eastern States, and so continued as the depression advanced eastward into the St. Lawrence valley on the 11th. The precipitation on the Middle Atlantic coast was attended on the morning of the 11th by the formation of a small disturbance, No. VII, which, as it moved from Virginia over New Jersey, was attended, for a time, with very severe gales, and which probably by midnight had reached Maine and joined the original depression No. VI.

No. VIII. This depression had an origin similar to that of No. VI; the area of very cold air that, on the 12th, extended southward over Iowa, was opposed by warmer southerly winds over the entire Southwest, and on the 12th, there appear to have existed several slight depressions, with cloudy weather, from the Missouri valley to the Middle Atlantic States, over which region the isotherms of 10, 20, 30 and 40° were unusually crowded together, so that, for instance, on the afternoon of the 12th there were reported from Indianapolis and Cincinnati northerly winds with temperatures of 13° and 18° respectively, but from Louisville, south winds and temperature of 41°. This

belt of depression rapidly gave way before the area of high barometer, No. 6, pressing southward, and there were left, on the morning of the 13th, two slight depressions respectively in Texas and Virginia; the latter disappeared off the East Atlantic coast, while the former continued, until the morning of the 17th, to be represented in Texas and on the Gulf coast by continued threatening and rainy weather. The gradual extension southward of the cold northerly winds, together with their increasing force and the heavy rains along the whole Gulf coast on the 16th and 17th, render it probable that several quite local storms must have prevailed there during those days, of which, however, nothing more is known.

No. IX. This slight depression appears on the morning of the 16th in Manitoba, having to the southeast of it the area of high barometer No. VI, then central in the Ohio valley. The low pressure moved during the day southeastward over Lakes Superior and Huron, and was, on the morning of the 17th, central at Ottawa, Canada, having been followed by a very rapid increase in pressure over the Northwest and upper Lakes. At midnight of the 16th, between Marquette and Bismarck, the gradient was 1 inch in 500 miles. After entering New York State on the 17th, the central depression turned to the northeastward over Maine and the Gulf of St. Lawrence.

No. X. This depression, like the preceding one, first appears in Manitoba, following closely after high barometer No. 6; its principal development probably took place north of our stations, and on the maps of the 18th, the only indication of its presence is a belt of low barometer extending several hundred miles southward from the Lake region, and which may perhaps be regarded as a branch of the main depression to the northward. On the 19th, this branch stretched further south in Florida, forming an ill-defined belt of low barometer, bounded on the east by southeast winds, clouds and rain, but on the west by northwest winds and snow. By the afternoon of the 20th, this had contracted into a well-defined low barometer, central over Massachusetts, and which moved then east-northeast, producing the lowest pressure recorded during the month at Halifax.

No. XI. On the afternoon of the 21st of February, southerly winds prevailed from the Gulf coast northward to Lake Superior and central Dakota, while in northern Dakota and Manitoba cold northerly winds were reported, with snow, and high westerly winds at Cheyenne, in Wyoming; at midnight of the 21st, falling barometer prevailed west of the Mississippi, the disturbance being probably central in the southeastern corner of Dakota, with rising barometer and falling temperature to the north of it. This disturbance developed by the afternoon of the 22d into a belt of low pressure extending from Indian Territory to Lake Huron, the isobar of 29.80 being apparently 950 miles long by about 200 broad. This was accompanied, as usual, by the belt of crowded isothermal lines that mark regions of opposing northerly and southerly winds. The length of this barometric trough was apparently doubled by midnight of the 22d, and on the morning of the 23d its southwestern extremity had formed a well defined storm-centre in Indian Territory, which, during the rest of the day, moved northward to Iowa, forming a violent and destructive tornado in Missouri; thence eastward to Illinois and northeastward over the Lower Lake region. At the same time there formed to the southwest a series of slight depressions constituting an apparent extension of area No. XI into a belt of low pressure, but the formation of which probably was due, as usual, to the conflict between the cold northerly winds of high barometer No. 11 and the warm southerly winds from the Gulf.

No. XII. The beginning of area No. XII is coincident with the formation, on the afternoon of the 24th, of the southwestern extension of No. XI, as mentioned in the pre-

ceding section; like No. XI, it was formed by the isolation, as it may be called, of the southwestern end of that belt, and passed northeastward from Arkansas to New York, where it was central on the 25th, being attended with southwesterly gales on the South and Middle Atlantic coasts. On the 26th, in the afternoon, it was apparently central near Cape Roziere.

No. XIII. On the morning of the 25th, high barometer No. 11 extended over Texas; thence to Nebraska southerly winds prevailed during the day, with falling barometer, while to the northward cold northerly winds prevailed over Dakota and Minnesota: thus in the afternoon at Omaha and North Platte the temperatures were respectively 37° and 44°, while at Yankton 8° was reported. The area of falling barometer and temperature contrasts, moved slowly south and east, and on the morning of the 26th stretched from Kansas to Lake Erie; southerly winds and higher temperatures prevailing at Leavenworth, Keokuk, Chicago, Indianapolis, Cincinnati and Cleveland, while cold northerly winds prevailed at the stations immediately north of these. The belt of depression was even more strongly marked on the afternoon of the 26th, when it extended from Indian Territory to New York, the isotherms for 20° and 40° were parallel to each other over the greater part of this belt at a distance of 50 to 150 miles. The western end of this barometric trough being closed up by the rapid advance southward of high barometer No. 12, there was left, principally, an area of low pressure which was in West Virginia at midnight on the 26th, and was central over Chesapeake Bay on the morning of the 27th. Snow prevailed during that day over the Middle and Eastern States, while the depression moved eastward to a considerable distance from the Atlantic coast; it seems probable that during the rest of the 27th the depression must have turned northeastward, unless the well-marked storm-centre over southern Nova Scotia at midnight of 27th originated in the heavy snow-fall that prevailed in that region.

No. XIV. High barometer No. 12 appears central on the afternoon of the 27th over the upper Mississippi valley, and falling barometer, with southeast winds, prevailed in Kansas and Nebraska. This, by the afternoon of the 28th, had developed into a well marked area of low barometer, central between Omaha and Leavenworth, which was drawn southward into Missouri and then developed into an extensive storm, whose history belongs to the following month.

ATMOSPHERIC TEMPERATURE.

The general distribution of temperature during the month is shown by the isothermal lines on chart No. II, from which it will be seen that an average of —5° or less is recorded for the greater part of Minnesota and the northwestern half of Dakota. On comparing the temperatures for the current month with those of February, 1856, the latter year, which was unusually cold, appears warmer by at least 5° throughout Illinois and Michigan; and by 10° throughout Missouri and Iowa; and by 15° or 20° in Minnesota; but was colder by from 5° to 10° throughout the Middle and Eastern States.

As an indication of the continued severity of the cold, the following figures are reported, showing the depth, in inches, to which the ground has been frozen: Conn., 46; Ga., 6; Ill., 48 to 72; Ind., 32; Iowa, 54; Md., 20 to 30; Mass., 36; Mich., 60; Mo., 12 and 14, 18 and 38; Neb., 48, 48, 30 to 40; N. H., 60; N. J., 60, 42, 28 and 36; N. Y., 36, 96, 22; Ohio, 28, 36, 22, 24, 28, 36 to 66, 42; Penn., 26, 18 to 24, 30; R. I., 48; Va., 8, 13.

(1.) *Range of temperature.*—The monthly range of temperature has been largest and most variable in the Middle and Eastern States, having amounted to from 46° to 90°,

according to the location of the station. In the Gulf States it has varied from 37° to 62°, and at Key West was 27°. For Minnesota, ranges from 44° to 60° are reported. At San Francisco the range was 23°.

(2.) *Unusually low temperatures.*—Temperatures of —35° or less have been reported as follows:—SIGNAL SERVICE STATIONS: Mt. Washington, 35°; Pembina, 41°, 39°, 44°, 40°, 35°; Duluth, 35°. CANADIAN STATIONS: Fort Garry, 36°, 35°, 38°, 35°, 36°, 36°, 37°, 35°, on as many different days. VOLUNTEER OBSERVERS: Oxford, Me., 34; Traverse City, Mich., 37; Hutchinson, Minn., 36; Woodstock, Vt., 30; Wien, Wis., 42; Embarrass, Wis., 48, mercury froze on the 9th and 12th; Beloit, Wis., 36.

PRECIPITATION.

The distribution of rain-fall (or melted snow) is given on Chart No. III as closely as possible, considering the unequal distribution and the limited number of returns, there being but about 500 rain-gauges to an area east of the Rocky Mountains of 20° in latitude by 40° in longitude. The precipitation has, of course, throughout the States north of the 35th parallel, taken the form of snow, and as many volunteer observers give the depth of the snow in inches without melting and measuring to ascertain the corresponding amount of water, it has been necessary in some cases to convert the recorded snowfall into water by multiplying by an empirical factor, for which one-tenth has been generally adopted in this country.

(1) *Depth of Snow.*—The total depth of snow fallen during the month, as recorded mostly by volunteer observers, is as follows in inches: Me., 6 to 18; N. H., 6 to 15; Vt., 13 to 15; Mass., 4 to 31; Conn., 8; N. Y., 3 to 42; N. J., 5 to 8; Penn., 5 to 30; Md., 3 to 13; Va., 1 to 11; Ohio, 2 to 15; Ky., 2 to 5; Tenn., 3; Ind., 2 to 16; Mich., 11 to 50; Ill., 6 to 13; Wis., 6 to 32; Mo., 3 to 9; Iowa, 5 to 18; Minn., 7 to 16; Kan., 1 to 9; Neb., 4 to 20.

(2) *Special Rains.*—The excess of rainfall in Tennessee, as shown on Map No. III, is due especially to the heavy rain attending storm No. XII, which prevailed during the 23d, 24th and 25th, in consequence of which a severe flood prevailed in the Holston river and the upper portions of the Cumberland and Tennessee rivers.

(3) *Droughts.*—In consequence of the deficient rainfall in the northern portion of the country throughout the preceding six months and the deeply-frozen ground, reports of failing wells or general deficiency of water have been received from Missouri, New Hampshire, New Jersey, New York, Pennsylvania and Connecticut. From similar causes the rivers have been somewhat lower than usual.

(4) *Rainy Days.*—The average number of days on which some rain or snow fell has been as follows, according to the locations: New England, from 5 to 15; Middle States, 4 to 12; South Atlantic States, 6 to 10; Eastern Gulf States, Ohio valley and Tenn., 9 to 12; Southwest, except 2 in western Texas, 9 to 14; southern shore of Lake Erie, 13 to 17; southern shore of Lake Ontario, 17 to 23; Mich., 11 to 22; Wis., 9 to 13; Iowa, 4 to 12; Minn., 2 to 12; Neb., 1 to 16; Kan., 1 to 10.

HUMIDITY.

The average relative humidity for the month, as reported from the Signal Service stations only, has been very uniform, and varies from 65 to 75, except at a few localities on the Lower Lakes, the Texas coast and the extreme Northwest, where averages of 80 or 85 are reported. Owing to the very low temperature that has prevailed in the latter section the observations are somewhat uncertain.

WINDS.

The prevailing winds have been northwest in the Middle and Eastern States, northeast in southern Florida, southeast in the Southwest, and southwest or northwest in the remaining sections of the country, as detailed on Chart No. II.

(1) The total movement of the wind has been, as usual, least at sheltered positions on the eastern side of the Appalachian range. The highest record of the month is 11,600 at Long Branch and Erie; other records are as follows: Indianola, 9,985; Peck's Beach, 9,847; Cheyenne, 9,057; New York, 9,060; Rochester, 9,375; Cape Henry, 9,077. The lowest are Lynchburg, 3,121; Augusta, 3,282; Nashville, 3,416; Shreveport, 3,569; Memphis, 3,880; Portland, Oregon, 2,178; San Diego, Cal., 3,130.

VERIFICATIONS.

(1) The detailed comparison of published Probabilities with the succeeding weather shows an average percentage of verifications of 83 per cent; the range being from 79 in the lower Missouri valley to 87 in New England.

(2) The reports of Signal Service observers at their respective stations show that, of 149 signals displayed at 28 stations on the Atlantic and Gulf coasts, 13 have not yet been heard from, 67 have been verified at the stations themselves, 40 not so verified and 29 were too late, while 11 occasions have been noted on which signals would have been justifiable if ordered. On the Lakes the display of signals has not yet been resumed.

NAVIGATION.

The maximum and minimum heights of water in the rivers are noted in the table on Chart No. III. Special interest attaches to the serious interruption, by ice, of the navigation, both in the interior and along the coasts from Cape Henry to Nova Scotia. The record of the thickness of ice on the coast, as well as on the fresh-water lakes and rivers, will give some indication of the severity of the season

(1.) *Fresh-water ice.*—The thickness of ice is reported, in inches, as follows: Nebraska—Missouri river, 25 to 27; Penn, pond ice, 16, under eight inches of snow; river ice, 18 to 24, and at Williamsport, 30; small creeks solid. N. J.—Trenton, ice 24; Freehold, 8. Vt.—Lake Champlain, 18; pond ice, 31 to 48. N. H.—Dumbarton, 16; creeks solid. N. Y.—Lockport canal, 22; Seneca Lake, 6, entirely across. Va.—Alexandria, Potomac river, 10 and 12. Wis.—Milwaukee, Lake Michigan, 24.

(2.) *Ocean water.*—N. Y. City, 12 to 16; Sandy Hook, N. Y., 15 at shore, 5 at five hundred yards off shore. N. J.—Squan Beach, 3. Conn.—New Haven, 20 to 26. Maine.—Penobscot Bay to Machias Bay, 10 to 12, and in retired creek, 30.

(3.) *Obstruction of navigation.*—From special reports in answer to an official circular, it appears that the first inconvenience from ice was felt at New York bay, January 15th, continuing to February 25th, and proving the most severe obstruction since 1847. Ice-floes of one or two square miles surface, and packs or hummocks twenty feet high were quite common. The movements of the ice in this region were regulated principally by the tides, unless the hourly wind velocity exceeded twelve miles. In Long Island Sound heavy floes and packs were sometimes five or six feet thick and three or four miles in diameter, and harbors were closed for two and three weeks. On the coast of Maine, from Penobscot to Machias bays the ice was almost unbroken for fifteen miles off shore, but Eastport harbor was unobstructed. Baltimore was harbor nearly blocked up, and heavy ice-drift reported at Cape Henry.

Cape Cod.—A fleet of fifteen or more vessels were frozen in during the latter half of the month.

Harbors and rivers were first freed from ice on the following dates: 22d, Sandy Hook; Louisville, Ky., (closed sixteen days;) 23d, Detroit, Mich.; Dutch Island, R. I.; New Haven, Conn., (closed fourteen days,) Newport, R. I.; 24th, Pittsburgh, Penn., Washington, D. C.; 25th, Morgantown, W. Va., Tarentum, Penn., (closed fifty-three days,) New York bay; 26th, Springfield, Mass., St. Louis, Mo.

TEMPERATURE OF WATER.

The maximum and mininum temperatures of the water are given in the table on Chart No. II. The temperatures of the bottom water have been on the average above that of the air for the following stations: *Atlantic and Gulf stations.*—Eastport, 15°; Portland, 10°; Wood's Hole, 7°; New London, 7°; New York, 4°.5; Jacksonville, 4°; Punta Rassa, 6°; Mobile, 0°.5. *River stations.*—Pittsburgh, 12°.5; Louisville, 6°; Knoxville, 7°.5, Nashville, 3°.5; St. Louis, 6°; Cairo, 4°.

The average temperature of the air and bottom water has been sensibly the same at Wilmington, Augusta, Charleston and Key West.

The water temperatures have been lower than the air at Savannah, 1°; Memphis, 1°.5; Shreveport, 1°; Galveston, 1°, and Indianola, 1°. Throughout the month the water from New Jersey to Nova Scotia has been from 28 to 34° in temperature.

ATMOSPHERIC ELECTRICITY.

(1) *Thunder Storms.*—Storms accompanied by electricity, with hail, prevailed very widely on the 23d, 24th and 25th. The general distribution of the storms for the month is shown by the fact that they occurred on the 2d, in Ga., Tenn., Ala. and Ind.; 3d, in Ga. and Tenn.; 10th, Ala. and La.; 11th. Ga.; 19th, La.; 20th, Kan.; 22d, Kan. and La.; 23d, Ala., Ga., Ill., Ind., Iowa, Kan., Ky., Mich., Mo., Neb., N. C., Tenn. and Wis.; 24th, Ala., Ga., Ill., Ind., Ky., Me., Mich., N. Y., N. C., Ohio, Penn., S. C., Tenn. and Va.; 25th, Ala., Ga., Mass., N. C., Tenn. and Va.; 28th, Ill., Ind., Kan., Mo. and Tenn.

(2) *Auroras.*—The principal auroras of the month were those of the 26th and 28th. The former, as seen at stations in the West, was more finely developed than as seen in New England; it was observed over an unusually large area. In detail, auroras were visible as follows: On the 3d, in Tex.; 6th, N. Y.; 7th, Me., Minn., N. Y., Vt., and Mich.; 9th, N. J.; 14th, Mo.; 18th, Vt.; 24th, Conn. and Me.; 25th, N. Y. and Va.; 26th, Me., Vt., N. H., Mass., Conn., N. Y., N. J., Penn., Del., Md., Va., W. Va., Can., Fla., Tenn., Mich., Ind., Ill., Wis., Minn., Iowa, Neb. and Kan.; 27th, Iowa, Ill., Md., N. Y., N. J., Va. and Tex.; 28th, Me., Vt., N. Y., Conn., R. I., Mass., Tenn. and Ind.

OPTICAL PHENOMENA.

(1) *Solar Halos.*—The record of solar halos for this month is unusually large, even for so cold a month; they were observed as follows: 1st, Mass. and Ala.; 2d, N. Y., Ga., Conn., Mass., Del., N. H. and Pa.; 3d, Minn., Ala., Ill., Ind., Iowa., Kan., Mass., Mo., Neb. and Va.; 4th., Col., Tex., Mich., Iowa, Ind., Ill. and Ala.; 5th, Ala., Ind., Neb., N. Y. and Wis.; 6th, Ill., Ind., Iowa, Kan., Neb., N. H., Ohio, N. H., Tenn. and Wis.; 7th, Mass., Minn., Conn., Ill., Me., N. H., N. Y., Pa. and Wis.; 8th, Ind., Tex., Ill., Me., Mass., Mich., N. H., N. Y., Pa. and Vt.; 9th, Ga., Ill., Ind., Me., Mass, Mich., N. Y. and Wis.; 10th, Neb., N. Y., Pa. and Va.; 11th. Minn., Ill., Ind., Iowa, Neb. and Wis.; 12th, N. M., Del., Me., Mich., N. J., N. Y., Ohio and Wis.; 13th, Mass., Mich. and N. Y.; 14th, Mass. and N. M.; 15th, Ind., N. H. and N. Y.; 16th, Minn., Col. and Mich.; 17th, Mass., Ind., Iowa, Kan., Mich., Neb., N. Y. and Ohio; 18th, Mass., N. Y., D. C., Ill., Ind., Mich., Pa. and Wis.; 19th, Me., N. H. and N. Y.; 20th, Iowa; 21st, D. C., Pa., N. J., Mich. and Wis.; 22d, Ala., Neb., N. H., N. Y. and Wis.; 23d, Mass., Pa., W. Va., Conn., Del., Md., N. H., N. Y. and Wis.; 24th, Iowa, Kan., Me., Neb. and Wis.: 25th, Neb.; 26th, Iowa, Neb. and Ohio; 28th, Ala., Ga., Tenn. and Va.

(2) *Lunar Halos.*—Full moon occurred February 20, and lunar halos were generally observed over comparatively small areas, the most important one being that of the evening of 18th, when the entire country was covered by a layer of cold, damp air, which was almost simultaneously precipitated as rain or snow on the morning of the 19th at every station from which reports were received. The record for the month is as follows: 3d, Minn., Ill., and Kan.; 4th, Ill.: 7th, Ill.; 9th, Ind.; 10th, Md., D. C., Va., N. J.; Del., Me., Mass., N. H. and Pa.; 11th, Wis.; 12th, Tenn., Mich., S. C., Tex., Ga., Kan., Neb., N. Y. and Pa.; 13th, Va., Tenn., Pa., Conn., I. T., N. M., Md., Mo., N. Y., N. C., Ohio, S. C.; 14th, Ala., I. T. and N. M.; 15th, Va., Tenn., N. H., N. Y., N. C. and Utah; 16th, Ga., Pa., W. Va., Miss., Iowa, Kan., Mich., Mo., Tenn. and Wis.; 17th, Mass., Me., Ind., N. C. and Tenn.; 18th, D. C., Del., Md., Mich., N. H., N. J., N. Y. Ohio, Pa., Tenn., Vt., W. Va., Conn. and Mass.; 19th, Neb., Mich. and N. Y.; 20th, Iowa, Ill., Ind., Minn. Neb., N. J. and Ohio; 21st, Mich., Wis., Ill. and Ohio. 22d, Mass. and Mich.; 25th, Kan.; 26th, Tenn. 27th, N. H.

(3) *Mirage.*—Mirage was observed in Kansas, at Atlanta on the 3d, 4th, 5th, 8th, 14th, 15th, 26th, 27th, 28th, and at Ellenwood on the 4th, 7th, and 8th.

MISCELLANEOUS.

(1) *Zoological.—Blue Birds* were observed at New London on the 23d; Fort Gibson, 21st; Welborn, Fla., 20th; Burnt Mills, N. J., 22d; Bethel, Ohio, 22d; Jacksonsburg, Ohio, 24th; Vineland, N. J., 25th. *Robins.*—New London, 23d; Fort Gibson, 21st; Hinsdale, Mass., 14th; Lynchburg, Va., 15th; Mt. Sterling, Ill., 20th; Bethel, Ohio, 22d; Vevay, Ind., 24th. *Frogs.*—Prospect Hill, Va., 3d and 25th; Hacienda Saluda, S. C., 20th and 24th; Troy, Ala., 23d; Cleaveland, Tenn., 24th. *Seals.*—New York outer bay seen on several occasions. *Larks.*—Welborn, Fla., 12th, moving north; Bethel, Ohio, 22d; Hudson, Mich., 23d. *Wild Geese.*—Wilsonville, Ala., moving north, 19th; Wet Glaze, Mo., moving north, 20th and 21st; Cave Spring, moving north, 21st; Brook Haven, Miss., moving north, 26th; Holton, Kan., moving north, 27th; Corning, Mo., moving north, 27th; Alto Vista, Va., moving north, 27th; Wilsonville, Ala., moving north, 28th; Le Roy, Kan., (geese winter here;) Warrensburg, Mo., 20th to 27th, flying north and south. *Brant Geese.*—Le Roy, Kan., 20th. *Wild Ducks.*—Louisville, Ill., going north, 26th and 28th; Warrensburg, Mo., flying north and south, 20th to 27th. *Mocking Birds.*—Welborn, Fla., 22d. *Killdeer.*—Le Roy, Kan., 22d. *Cat Birds and Black Birds.*—Bellefontaine, Ohio, 23d. *Bees.*—Bethel, Ohio, 24th; Pennville, Penn., 25th. *Cranes.*—Prospect Hill, Va., 24th. *Buzzards.*—Bethel, Ohio, 28th.

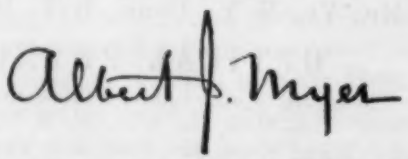
(2) *Meteors.*—The most remarkable meteor of the month is that which actually fell on the 12th in Iowa, a fragment of which, weighing seven pounds, was found near Homestead, and is preserved in the cabinet of the State University. Brief notices are at hand regarding bright meteors from the following States: 1st, New Jersey; 3d, New York; 5th, Georgia; 7th, Wisconsin; 9th, Georgia; 12th, Illinois, Iowa, Minnesota, Nebraska, Kansas; 14th, Indiana, Pennsylvania; 21st, Pennsylvania, Florida; 24th, Missouri, Louisiana; 26th, Minnesota; 27th, Indiana, Wisconsin, Florida; 28th, Vermont.

(3) *Polar bands* are recorded on the 4th and 14th at Atlantic City; 19th, at North Platte; 15th, at Milwaukee; 21st, at Cleveland.

(4) *Zodiacal light* was observed on the 1st, in Ohio, and on the 7th, in Indiana.

(5) *Earthquakes.*—A severe shock of earthquake was felt on the 7th, at San Francisco, at 10:56, A. M., lasting from two to four seconds, and followed by another at 11:50, A. M., lasting about the same length of time. No damage is reported.

PUBLISHED BY ORDER OF THE HON. WM. W. BELKNAP, SECRETARY OF WAR.



Brig. Gen. (Bvt. Assg^d.) Chief Signal Officer, U. S. A.

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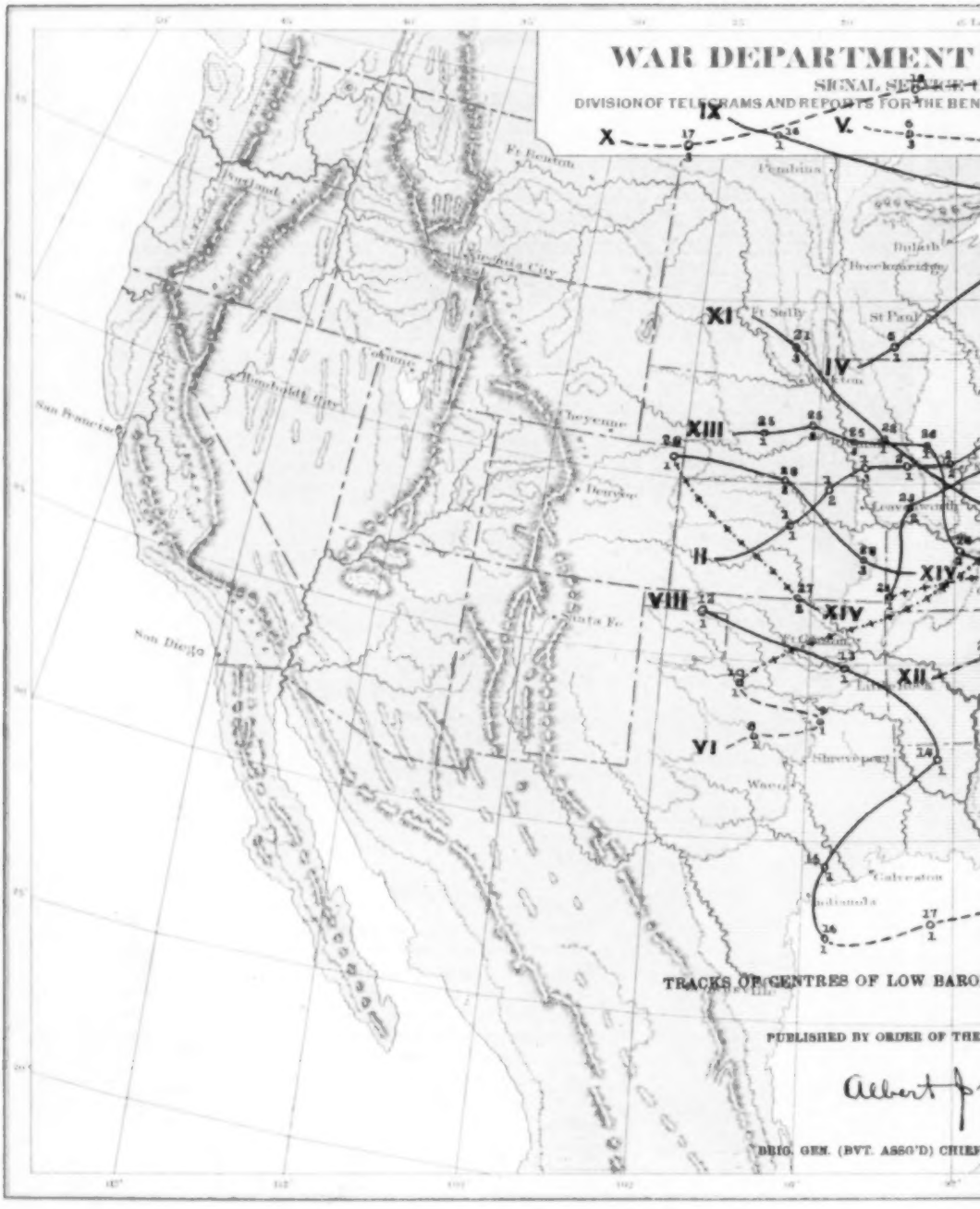
WAR DEPARTMENT
SIGNAL SERVICE
DIVISION OF TELEGRAMS AND REPORTS FOR THE BEN
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TRACKS OF CENTRES OF LOW BARO
PUBLISHED BY ORDER OF THE
BRIG. GEN. (BVT. ASSO'D) CHIE

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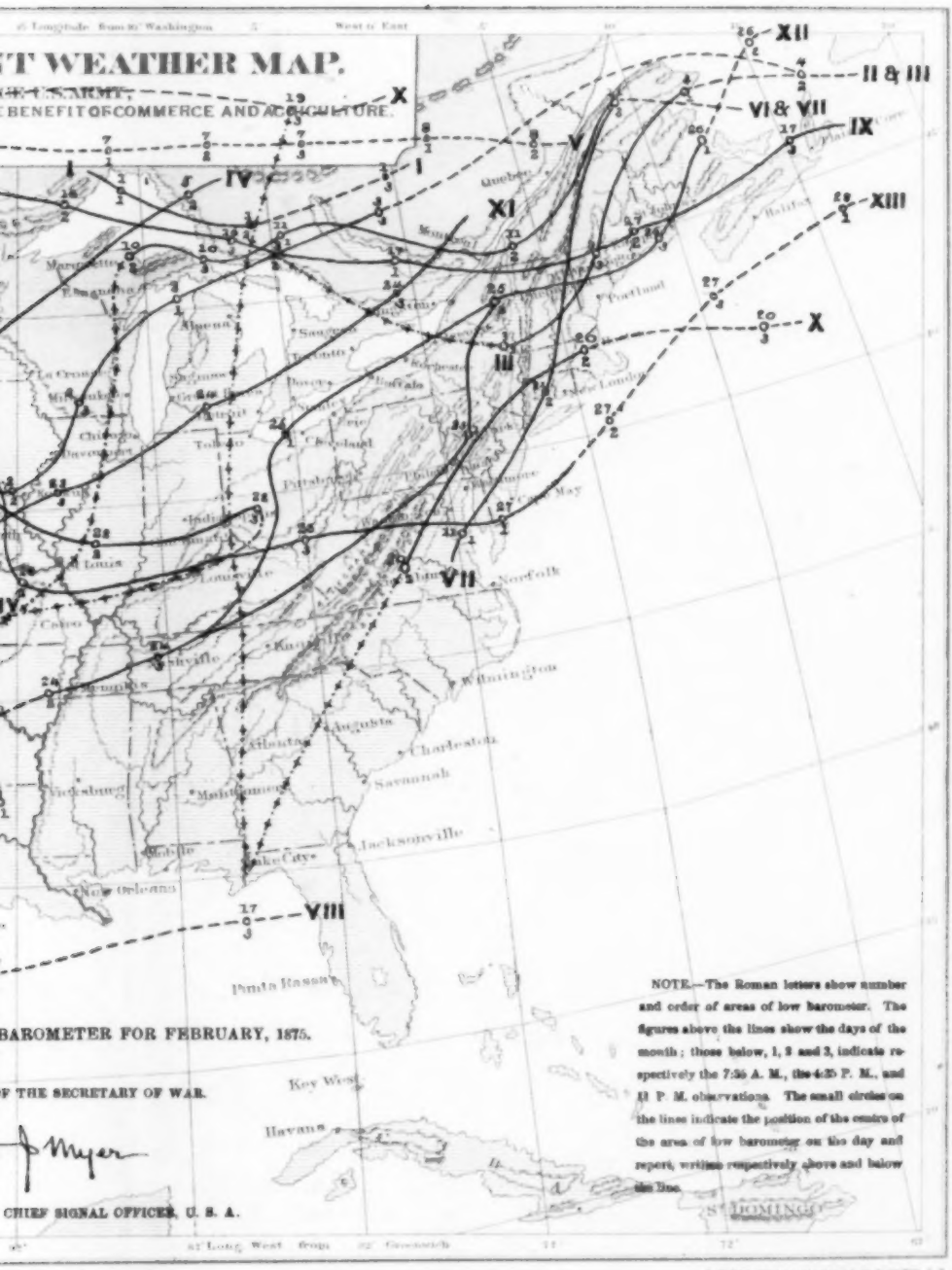


BAROMETER FOR FEBRUARY, 1875.

F THE SECRETARY OF WAR.

J Myer

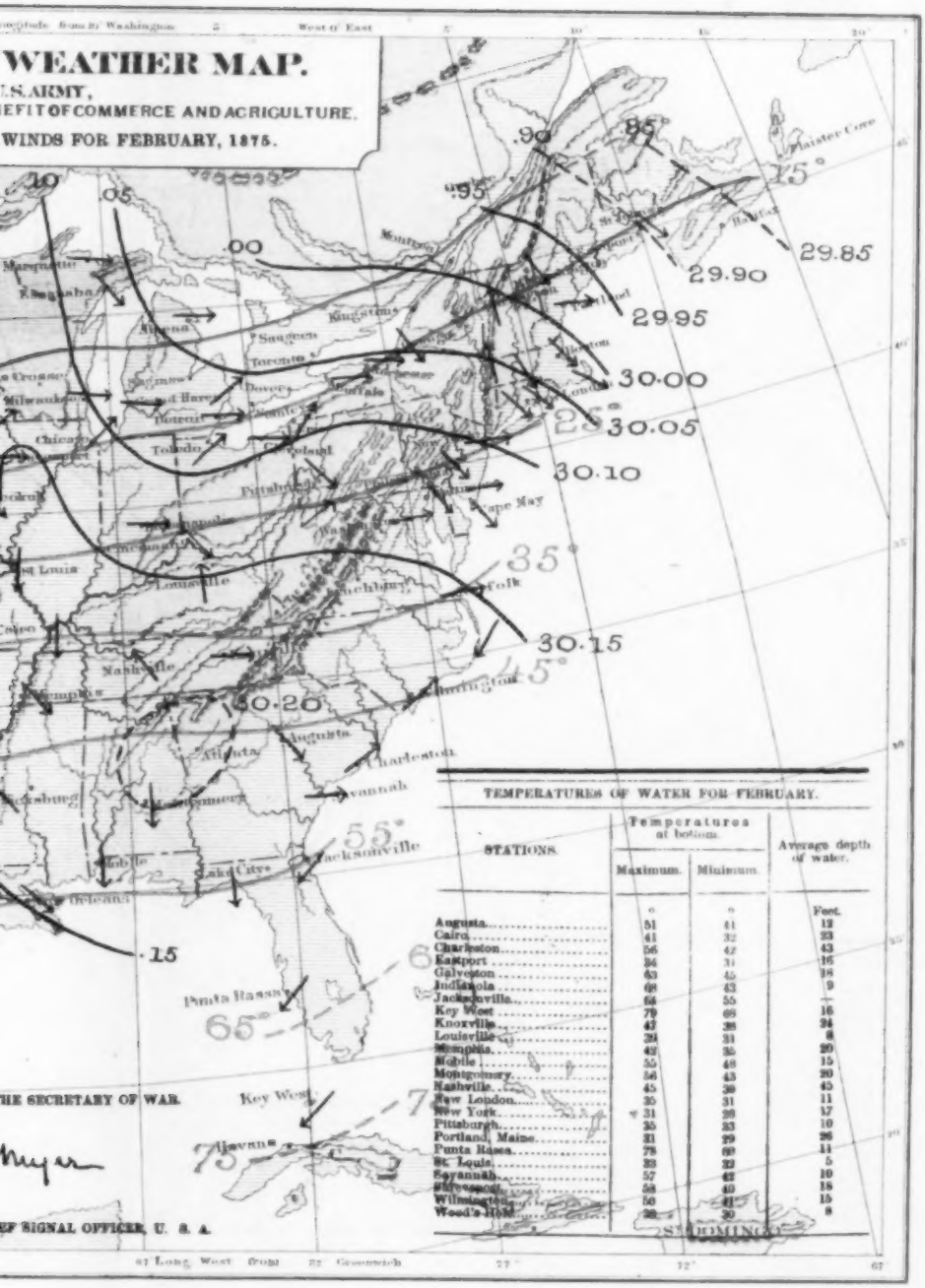
CHIEF SIGNAL OFFICER, U. S. A.

NOTE.—The Roman letters show number and order of areas of low barometer. The figures above the lines show the days of the month; those below, 1, 2 and 3, indicate respectively the 7:35 A. M., the 4:35 P. M., and 11 P. M. observations. The small circles on the lines indicate the position of the centre of the area of low barometer on the day and report, written respectively above and below the line.

H. PETERS, PHOTO-LITHOGRAPHER, WASHINGTON, D. C.

AVERAGE MEAN TEMPERATURES FOR FEBRUARY.

DISTRICTS.	Average for February.		Comparison of February, 1875, with the average for many years.
	For many years.	For 1875.	
St. Lawrence valley	15.1	6.0	9°.1 below.
New England	25.5	19.9	5°.6 below.
Middle Atlantic States	35.4	30.0	5°.4 below.
South Atlantic States	51.4	48.8	2°.6 below.
Gulf States	55.7	53.3	2°.4 below.
Lower Lake region	25.7	13.4	12°.3 below.
Upper Lake region	21.3	6.1	15°.2 below.
Ohio valley and Tennessee	37.3	30.6	6°.7 below.
Upper Mississippi valley	24.6	11.1	13°.5 below.
Lower Missouri valley	27.8	16.3	11°.6 below.
Minnesota	13.3	4.7	17° below.
Pacific Coast	49.0	48.6	0°.4 below.



TEMPERATURES OF WATER FOR FEBRUARY.

STATIONS.	Temperatures at bottom.		Average depth of water.
	Maximum.	Minimum.	
	°	°	Feet.
Augusta	51	41	12
Cairo	41	32	23
Charleston	56	42	43
Eastport	36	31	16
Galveston	63	45	18
Indianola	68	43	9
Jacksonville	66	55	—
Key West	79	68	16
Knoxville	47	38	24
Louisville	39	31	6
Memphis	49	35	20
Mobile	55	48	15
Montgomery	54	45	20
Nashville	45	36	45
New London	35	31	11
New York	31	28	17
Pittsburgh	35	33	10
Portland, Maine	31	29	26
Punta Rassa	78	69	11
St. Louis	33	32	5
Savannah	57	43	19
Shreveport	58	42	16
Wilmington	50	41	15
Wood's Hole	36	30	8

THE SECRETARY OF WAR.

CHIEF SIGNAL OFFICER, U. S. A.

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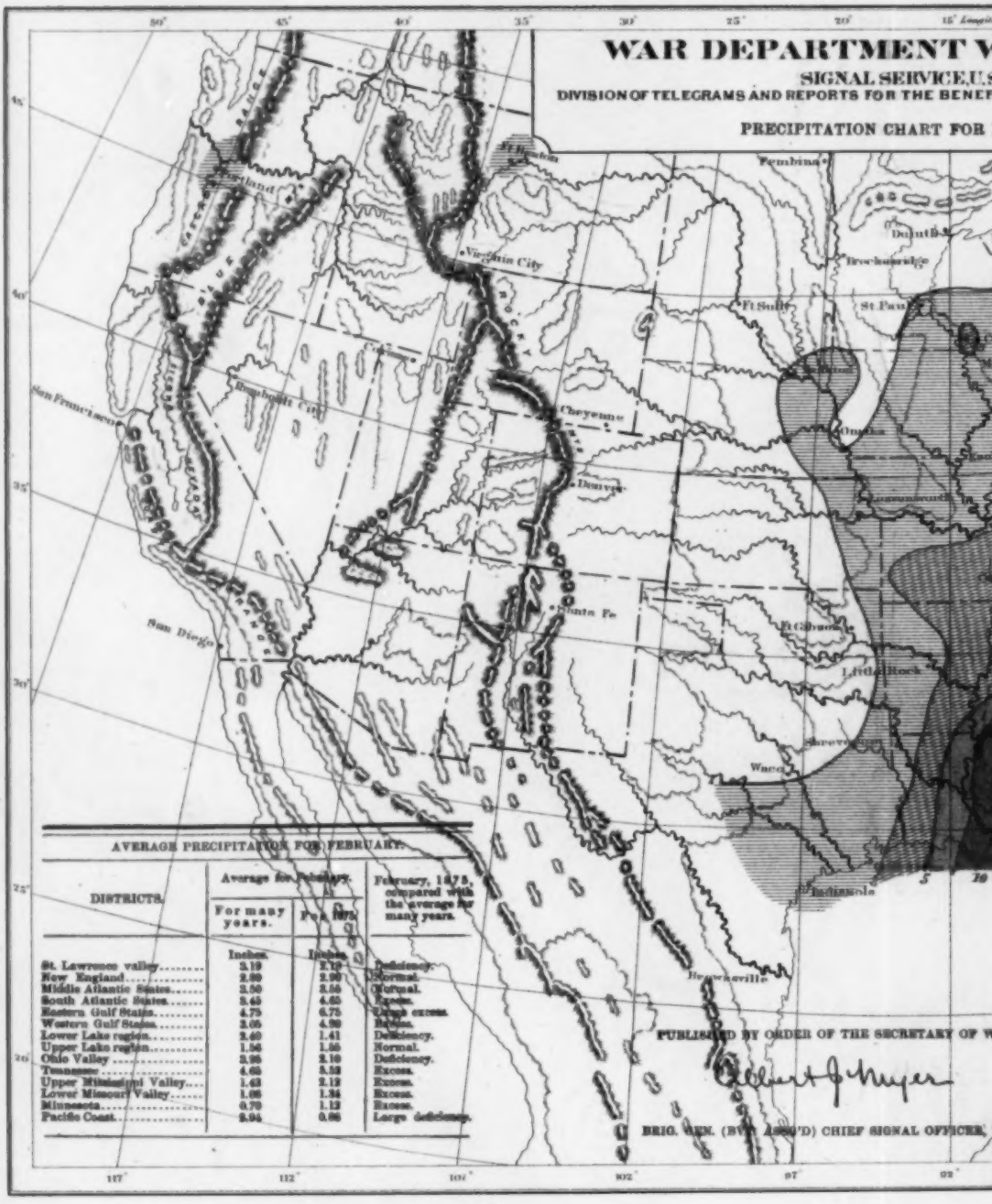


AVERAGE PRECIPITATION FOR FEBRUARY.

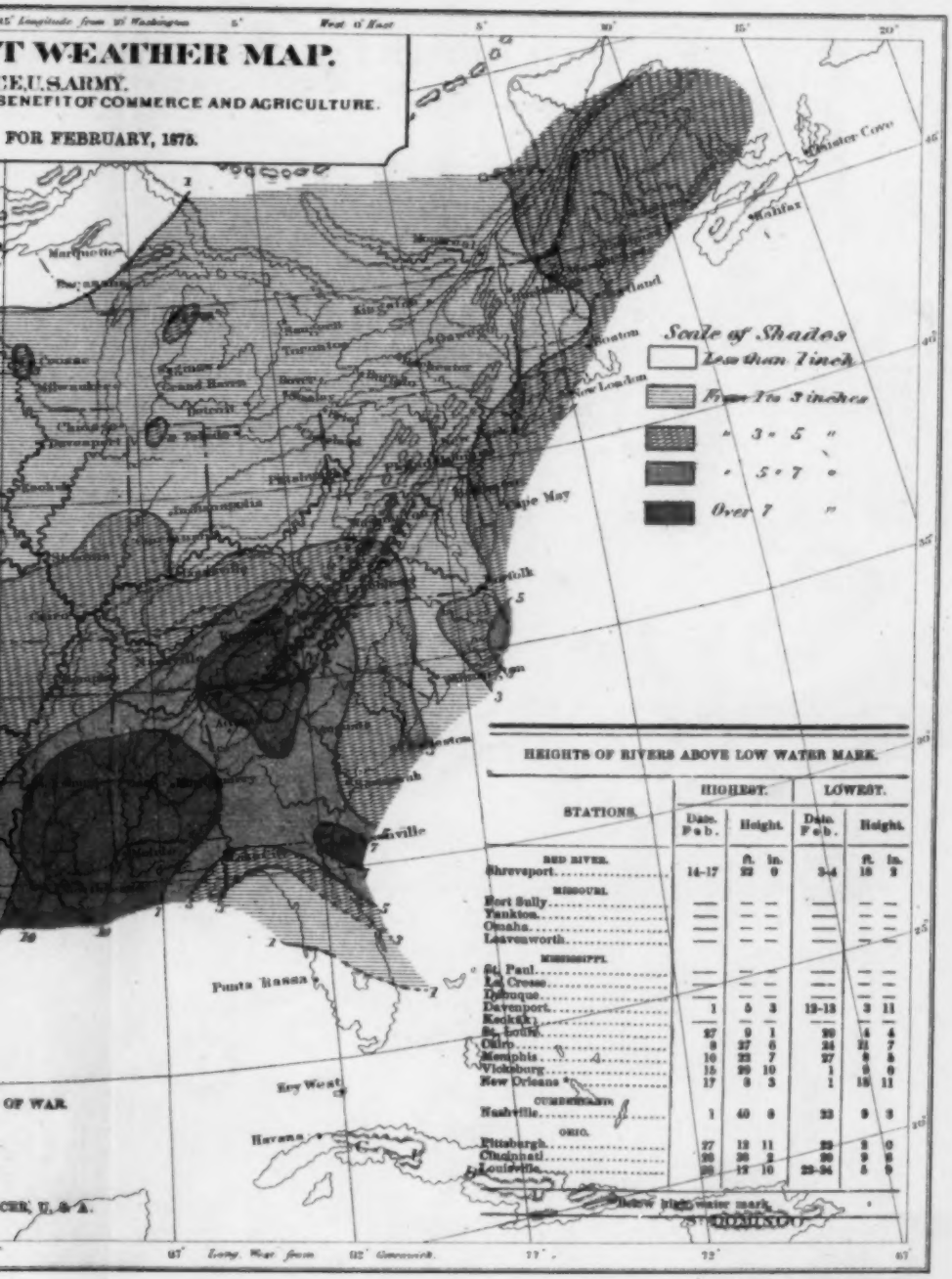
DISTRICTS.	Average for February. For many years.	Average for February. For 1875.	February, 1875, compared with the average for many years.
	Inches.	Inches.	
St. Lawrence valley	2.19	2.19	Deficiency.
New England	2.89	2.90	Normal.
Middle Atlantic States	3.50	3.56	Normal.
South Atlantic States	3.45	4.65	Excess.
Eastern Gulf States	4.75	6.75	Large excess.
Western Gulf States	3.05	4.20	Excess.
Lower Lake region	2.40	1.41	Deficiency.
Upper Lake region	1.56	1.56	Normal.
Ohio Valley	2.98	2.10	Deficiency.
Tennessee	4.65	5.53	Excess.
Upper Mississippi Valley	1.43	2.12	Excess.
Lower Missouri Valley	1.06	1.34	Excess.
Minnesota	0.70	1.12	Excess.
Pacific Coast	2.94	0.86	Large deficiency.

T WEATHER MAP.

CE, U.S. ARMY.

BENEFIT OF COMMERCE AND AGRICULTURE.

FOR FEBRUARY, 1875.



HEIGHTS OF RIVERS ABOVE LOW WATER MARK.

STATIONS.	HIGHEST. Date. Feb.	HIGHEST. Height.	LOWEST. Date. Feb.	LOWEST. Height.
		ft. in.		ft. in.
RED RIVER.				
Shreveport	14-17	22 0	3-4	16 2
MISSOURI.				
Fort Sully	——	— —	——	— —
Yankton	——	— —	——	— —
Omaha	——	— —	——	— —
Leavenworth	——	— —	——	— —
MISSISSIPPI.				
St. Paul	——	— —	——	— —
La Cresse	——	— —	——	— —
Dubuque	——	— —	——	— —
Davenport	1	5 3	12-13	3 11
Rock Island	——	— —	——	— —
St. Louis	27	9 1	26	4 4
Cairo	9	37 6	24	11 7
Memphis	10	23 7	27	6 5
Vicksburg	15	20 10	1	0 0
New Orleans *	17	8 3	1	15 11
CUMBERLAND.				
Nashville	1	40 6	23	9 3
OHIO.				
Pittsburgh	27	12 11	23	1 0
Cincinnati	28	28 2	20	9 6
Louisville	28	17 10	23-24	5 6

Below high water mark.

ST. DOMINGO

W. PETERS, PHOTO-LITHOGRAPHER, WASHINGTON, D. C.